

WHAT IS CLAIMED IS:

1. An image processing apparatus for processing color images, comprising:

5 a feature amount calculation section for calculating a feature amount with respect to a pixel of interest;

10 a background sensing section for sensing a background density or a background color with respect to a region surrounding the pixel of interest whose feature amount is calculated by the feature amount calculation section;

15 a plurality of character determination sections for determining whether the pixel of interest corresponds to a character or a line drawing on the basis of the feature amount calculated by the feature amount calculation section, said plurality of character determination sections using mutually different determination methods; and

20 a character determination selector section for selecting one of determination results output from the character determination sections in accordance with a sensing result output from the background sensing section.

25 2. An image processing apparatus according to claim 1, wherein different reference values are set to said character determination sections, and each of said character determination sections compares a reference

value assigned thereto with the feature amount  
calculated by the feature amount calculation section,  
thereby determining whether the pixel of interest  
corresponds to the character or the line drawing.

5           3. An image processing apparatus according to  
claim 1, wherein said feature amount calculation  
section calculates a feature amount of the pixel of  
interest by using a first region defined surrounding  
the pixel of interest, and said background sensing  
10 section senses a background density or a background  
color regarding a region surrounding the pixel of  
interest by using a second region which is similar in  
size to the first region or greater than the first  
region.

15           4. An image processing apparatus according to  
claim 1, wherein said background sensing section senses  
the background density or background color by using  
only those pixels which the determination result  
selected by the character determination selector  
20 section regards as an object other than the character  
or line drawing.

          5. An image processing apparatus according to  
claim 1, wherein said feature amount calculation  
section calculates the feature amount on the basis of  
25 density gradients or distances in a color space between  
pixels detected in different directions with respect to  
a predetermined region surrounding the pixel of

interest.

6. An image processing apparatus according to claim 1, wherein said background sensing section prepares a histogram regarding a density detected in a predetermined region surrounding the pixel of interest, and determines that a sensed density is a background density when the sensed density is within a range that is lower than a predetermined value, and when the sensed density repeatedly appears more than a predetermined number of times and the number of times the sensed density appears is largest.

7. An image processing apparatus according to claim 1, wherein:

when the background sensing section fails to detect the background density or background color of a character, the background sensing section outputs a sensing result signal indicating that a background sensing operation results in failure;

said plurality of character determination sections include at least one character determination section that determines whether the pixel of interest represents a character or a line drawing by using a determination method suited to a case where the background density or the background color cannot be detected; and

when said character determination selector section receives from the background sensing section the signal

indicating that the background sensing operation results in failure, said character determination selector section selects a determination result output from said at least one character determination section, which determines whether the pixel of interest represents a character or a line drawing by using a determination method suited to a case where the background density or the background color cannot be detected.

8. An image processing apparatus according to claim 1, wherein:

said background sensing section senses whether the background of a character is white or a color other than white;

said plurality of character determination sections include a character determination section for determining whether a pixel represents a character or a line drawing by using a determination method suited to a case where the background is white, and a character determination section for determining whether a pixel represents a character or a line drawing by using a determination method suited to a case where the background is other than white; and

said character determination selector section selects a determination result output from the character determination section that determines whether a pixel represents a character or a line drawing by

using the determination method suited to the case where the background is white, when the background of the character is sensed as being white by the background sensing section, and selects a determination result output from the character determination section that determines whether a pixel represents a character or a line drawing by using the determination method suited to the case where the background is other than white, when the background of the character is sensed as being other than white by the background sensing section.

9. An image processing apparatus according to claim 1, wherein said background sensing section is a low-pass filter, and said feature amount calculation section is a high-pass filter.

10. An image processing apparatus for processing color images, comprising:

a plurality of feature amount calculation sections for determining feature amounts with respect to a pixel of interest by using mutually different determination methods;

a background sensing section for sensing a background density or a background color with respect to a region surrounding the pixel of interest whose feature amount is calculated by the feature amount calculation sections;

a feature amount selection section for selecting one of calculation results output from the feature

amount calculation sections in accordance with a sensing result output from the background sensing section; and

5 a character determination section for determining whether the pixel of interest is a character or a line drawing on the basis of a feature amount selected by the feature amount selection section.

10 11. An image processing apparatus according to claim 10, wherein said feature amount calculation section calculates a feature amount of the pixel of interest by using a first region defined surrounding the pixel of interest, and said background sensing section senses a background density or a background color regarding a region surrounding the pixel of  
15 interest by using a second region which is similar in size to the first region or greater than the first region.

20 12. An image processing apparatus according to claim 10, wherein said background sensing section senses the background density or background color by using only those pixels which the determination result selected by the character determination selector section regards as an object other than the character or line drawing.

25 13. An image processing apparatus according to claim 10, wherein said plurality of feature amount calculation sections include at least one feature

amount calculation section that calculates the feature amount on the basis of density gradients or distances in a color space between pixels detected in different directions with respect to a predetermined region surrounding the pixel of interest.

14. An image processing apparatus according to claim 10, wherein said background sensing section prepares a histogram regarding a density detected in a predetermined region surrounding the pixel of interest, and determines that a sensed density is a background density when the sensed density is within a range that is lower than a predetermined value, and when the sensed density repeatedly appears more than a predetermined number of times and the number of times the sensed density appears is largest.

15. An image processing apparatus according to claim 10, wherein:

when the background sensing section fails to detect the background density or background color of a character, the background sensing section outputs a sensing result signal indicating that a background sensing operation results in failure;

said plurality of feature amount calculation sections includes at least one feature amount calculation section that calculates the feature amount of the pixel of interest by using a calculation method suited to a case where the background density or the

background color cannot be detected; and

said feature amount selection section selects a calculation result output from the feature amount calculation section that is included among said plurality of feature amount calculation sections and that calculates the feature amount of the pixel of interest by using the calculation method suited to the case where the background density or the background color cannot be detected.

16. An image processing apparatus according to claim 10, wherein:

said background sensing section senses whether the background of a character is white or a color other than white;

said plurality of feature amount calculation sections include a feature amount calculation section for calculating the feature amount of the pixel of interest by using a calculation method suited to a case where the background is white, and a feature amount calculation section for calculating the feature amount of the pixel of interest by using a calculation method suited to a case where the background is other than white; and

said feature amount selection section selects a calculation result output from the feature amount calculation section for calculating the feature amount of the pixel of interest by using the calculation



method suited to the case where the background is white,  
when the background of the character is sensed as being  
white by the background sensing section, and selects a  
calculation result output from the feature amount  
5 calculation section for calculating the feature amount  
of the pixel of interest by using the calculation  
method suited to the case where the background is other  
than white, when the background of the character is  
sensed as being other than white by the background  
10 sensing section.

17. An image processing apparatus according to  
claim 10, wherein said background sensing section is a  
low-pass filter, and said feature amount calculation  
section is a high-pass filter.

15 18. An image processing apparatus for processing  
color images, comprising:

a feature amount calculation section for  
calculating a feature amount with respect to a pixel of  
interest;

20 a background sensing section for sensing a  
background density or a background color with respect  
to a region surrounding the pixel of interest;

a plurality of color determination sections for  
determining colors with respect to the pixel of  
25 interest on the basis of a chroma and/or a hue thereof,  
said color determination sections using mutually  
different determination methods; and

a color determination selector section for selecting one of determination results output from the color determination sections in accordance with the feature amount the feature amount calculation section determines with respect to the pixel of interest or the background density or color the background sensing section senses.

19. An image processing apparatus according to claim 18, wherein different reference values are set to said color determination sections, and each of said color determination sections compares a reference value assigned thereto with the chroma and hue of the pixel of interest, thereby determining the color of the pixel of interest.

20. An image processing apparatus according to claim 18, wherein said plurality of color determination sections includes at least one color determination section that compares a chroma and/or a hue of a highest-density pixel of a predetermined region surrounding the pixel of interest with reference values, thereby determining the color of the pixel of interest.

21. An image processing apparatus according to claim 18, wherein said feature amount calculation section calculates the feature amount on the basis of density gradients or distances in a color space between pixels detected in different directions with respect to a predetermined region surrounding the pixel of

interest.

22. An image processing apparatus according to claim 18, wherein said background sensing section prepares a histogram regarding a density detected in a predetermined region surrounding the pixel of interest, and determines that a sensed density is a background density when the sensed density is within a range that is lower than a predetermined value, and when the sensed density repeatedly appears more than a predetermined number of times and the number of times the sensed density appears is largest.

23. An image processing apparatus according to claim 18, wherein:

when the background sensing section fails to detect the background density or background color of a character, the background sensing section outputs a sensing result signal indicating that a background sensing operation results in failure;

said plurality of color determination sections includes at least one color determination section that determines the color of the pixel of interest by using a determination method suited to a case where the background density or the background color cannot be detected; and

said color determination selector selects a determination result output from the color determination section that is included among said

plurality of color determination sections and that  
determines the color of the pixel of interest by using  
the determination method suited to the case where the  
background density or the background color cannot be  
5 detected, when said color determination selector  
section receives from the background sensing section  
the signal indicating that the background sensing  
operation results in failure.

24. An image processing apparatus according to  
10 claim 18, wherein:

said background sensing section senses whether the  
background of a character is white or a color other  
than white;

said plurality of color determination sections  
15 include a color determination section for determining  
the color of the pixel of interest by using a  
determination method suited to a case where the  
background is white, and a color determination section  
for determining the color of the pixel of interest by  
20 using a determination method suited to a case where the  
background is other than white; and

said character determination selector section  
selects a determination result output from the color  
determination section for determining the color of the  
25 pixel of interest by using the determination method  
suited to the case where the background is white, when  
the background of the character is sensed as being

white by the background sensing section, and selects a determination result output from the color determination section for determining the color of the pixel of interest by using the determination method suited to the case where the background is other than white, when the background of the character is sensed as being other than white by the background sensing section.

25. An image processing apparatus according to claim 18, wherein said background sensing section is a low-pass filter, and said feature amount calculation section is a high-pass filter.

26. An image processing apparatus for processing color images, comprising:

a feature amount calculation section for calculating a feature amount with respect to a pixel of interest;

a character determination section for determining whether the pixel of interest is a character or a line drawing on the basis of a feature amount calculated by the feature amount selection section; and

a color determination section for determining the color of the pixel of interest by comparing a chroma and/or a hue of a highest-density pixel of a predetermined region surrounding the pixel of interest with reference values.